

What is claimed is:

1. An isolated peptide exhibiting lipid acyl hydrolase activity and corn rootworm insect inhibitory bioactivity comprising the amino acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:21, SEQ ID NO:23, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, SEQ ID NO:40, and SEQ ID NO:41.
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2. The peptide according to claim 1 further comprising amino acid sequence motifs comprising
  - a) a first motif comprising Gly-Xaa<sub>1</sub>-Ser-Xaa<sub>2</sub>-Gly as set forth in SEQ ID NO:14, wherein Xaa<sub>1</sub> and Xaa<sub>2</sub> are Ser or Thr;
  - b) a second motif comprising Glu-Xaa<sub>1</sub>-Xaa<sub>2</sub>-Leu-Val-Asp-Gly as set forth in SEQ ID NO:15, wherein Xaa<sub>1</sub> comprises the amino acids selected from the group consisting of Tyr, Phe, and Trp, and wherein Xaa<sub>2</sub> comprises the amino acids selected from the group consisting of His and Asn; and
  - c) a third motif comprising Phe-Tyr-Xaa<sub>1</sub>-Glu-Xaa<sub>2</sub>-Gly-Pro as set forth in SEQ ID NO:42, wherein Xaa<sub>1</sub> comprises the amino acids selected from the group consisting of Phe, Ile, and Leu, and wherein Xaa<sub>2</sub> comprises the amino acids selected from the group consisting of His and Asn.
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3. The peptide according to claim 2 wherein the substitution of
  - a) Ser in said first motif for any other amino acid;
  - b) Asp in said second motif for any other amino acid; or
  - c) Xaa<sub>2</sub> in said third motif for any amino acid other than His or Asn eliminates the lipid acyl hydrolase activity and insect bioactivity of said peptide.
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4. The peptide of claim 1, wherein said peptide is not naturally occurring.

5. The peptide of claim 2, wherein said peptide is not naturally occurring.

5 6. A method for selecting an isolated protein exhibiting lipid acyl hydrolase activity and corn rootworm insect inhibitory bioactivity comprising the steps of  
a) identifying the amino acid sequence of said protein;  
b) identifying in said sequence the presence of  
i) a first motif comprising Gly-Xaa<sub>1</sub>-Ser-Xaa<sub>2</sub>-Gly as set forth in SEQ  
10 ID NO:14, wherein Xaa<sub>1</sub> and Xaa<sub>2</sub> are Ser or Thr;  
ii) a second motif comprising Glu-Xaa<sub>1</sub>-Xaa<sub>2</sub>-Leu-Val-Asp-Gly as set forth in SEQ ID NO:15, wherein Xaa<sub>1</sub> comprises the amino acids selected from the group consisting of Tyr, Phe, and Trp, and wherein Xaa<sub>2</sub> comprises the amino acids selected from the group consisting of His and Asn; and  
15 iii) a third motif comprising Phe-Tyr-Xaa<sub>1</sub>-Glu-Xaa<sub>2</sub>-Gly-Pro as set forth in SEQ ID NO:42, wherein Xaa<sub>1</sub> comprises the amino acids selected from the group consisting of Phe, Ile, and Leu, and wherein Xaa<sub>2</sub> comprises the amino acids selected from the group consisting of His and Asn;  
20 c) identifying a lipid acyl hydrolase activity; and  
d) identifying a corn rootworm insect inhibitory bioactivity.

7. The method of claim 6, wherein said protein is not naturally occurring.

25 8. A method for protecting a plant from Coleopteran insect infestation comprising providing to said plant a Coleopteran insect inhibitory amount of a protein exhibiting lipid acyl hydrolase activity, wherein said protein comprises  
a) a first motif comprising Gly-Xaa<sub>1</sub>-Ser-Xaa<sub>2</sub>-Gly as set forth in SEQ ID  
30 NO:14, wherein Xaa<sub>1</sub> and Xaa<sub>2</sub> are Ser or Thr;  
b) a second motif comprising Glu-Xaa<sub>1</sub>-Xaa<sub>2</sub>-Leu-Val-Asp-Gly as set forth in SEQ ID NO:15, wherein Xaa<sub>1</sub> comprises the amino acids selected from the

group consisting of Tyr, Phe, and Trp, and wherein Xaa<sub>2</sub> comprises the amino acids selected from the group consisting of His and Asn; and

5           c) a third motif comprising Phe-Tyr-Xaa<sub>1</sub>-Glu-Xaa<sub>2</sub>-Gly-Pro as set forth in SEQ ID NO:42, wherein Xaa<sub>1</sub> comprises the amino acids selected from the group consisting of Phe, Ile, and Leu, and wherein Xaa<sub>2</sub> comprises the amino acids selected from the group consisting of His and Asn.

9.         The method according to claim 8 wherein said protein is selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, SEQ ID  
10         NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:9, SEQ ID NO:10, SEQ ID  
       NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:21, SEQ ID NO:23,  
       SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:29, SEQ ID NO:31, SEQ ID  
       NO:33, SEQ ID NO:35, SEQ ID NO:36, SEQ ID NO:40, and SEQ ID NO:41.

15         10.      The method according to claim 8 wherein said protein is not naturally occurring.

11.         An isolated and purified nucleic acid sequence encoding a lipid acyl hydrolase comprising the nucleic acid sequence selected from the group consisting of SEQ ID NO:20, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:26, SEQ ID  
20         NO:28, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:34, SEQ ID NO:36,  
       SEQ ID NO:37, and SEQ ID NO:38.

12.         A method of transforming a plant cell to express a protein exhibiting a lipid acyl hydrolase activity and a corn rootworm inhibitory bioactivity comprising the steps of  
25         a) introducing into the DNA of a plant cell a polynucleotide sequence comprising a selectable marker and the following elements linked sequentially: a plant functional promoter operably linked to a sequence encoding said protein, which is operably linked to a plant functional 3'  
       transcription termination and polyadenylation sequence;

30         b) growing said plant cell in selective media to identify stably transformed plant cells; and

c) selecting a plant cell expressing said protein;  
wherein said protein expressed in said plant cell is selected from the group  
consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, SEQ ID  
NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:9, SEQ ID NO:10,  
SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:21, SEQ  
ID NO:23, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:29, SEQ ID  
NO:31, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, SEQ ID  
NO:40, and SEQ ID NO:41.